

PRELIMINARY DATA SUMMARY

December 1988

U.S. Army Engineer Waterways Experiment Station
Coastal Engineering Research Center
Field Research Facility
Duck, North Carolina

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CERC Field Research Facility
Duck, North Carolina

This report provides a summary of basic oceanographic, meteorological and bottom profile data for the month. The data were obtained as part of the Measurements and Analysis work units at the U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's Field Research Facility (FRF) in Duck, North Carolina. The FRF staff collected and analyzed these data. These summaries are intended to make the data readily available to all FRF users, and comments on their content and usefulness are invited.

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PART I: INTRODUCTION

The U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's (CERC's) Field Research Facility (FRF) is located on the Outer Banks of North Carolina, near the village of Duck (Figure 1).

The FRF research program provides a means for obtaining high-quality field data, particularly during storms, in support of the U.S. Army Corps of Engineers' coastal engineering research missions. The research pier is a reinforced concrete structure supported on 0.9-m-diam steel piles spaced 12.2 m apart along the pier's length and 4.6 m apart across the width. The pier deck is 6.1 m wide and extends from behind the duneline to about the 6-m water depth contour at a height of 7.6 m above the National Geodetic Vertical Datum (NGVD). In addition, a main building contains offices, an instrument repair shop, and a data acquisition room.

One of the responsibilities of the FRF research program is the collection, analysis and dissemination of data on local oceanographic and meteorological conditions. Bottom profiles along both sides of the pier and periodic bathymetric surveys are also performed.

This summary is intended to provide basic data as soon as possible after they are obtained. Questions and/or comments concerning the data may be directed to Mr. Michael W. Leffler at (919) 261-3511.

Part II presents the meteorological data; Parts III through VI present oceanographic data; Part VII presents nearshore profiles and bathymetry; and Part VIII, if included, documents special events that occurred at the FRF during the month.

Table 1 is a list of instruments used, their operational status during the month, and the data collection status. Figure 2 identifies the location of the instruments. The water depths at the wave gages and current meters vary and may be determined from information contained in Figure 7. Other installation information is contained in Table 1.

Times given in the report, unless otherwise specified, are referenced to eastern standard time (EST).

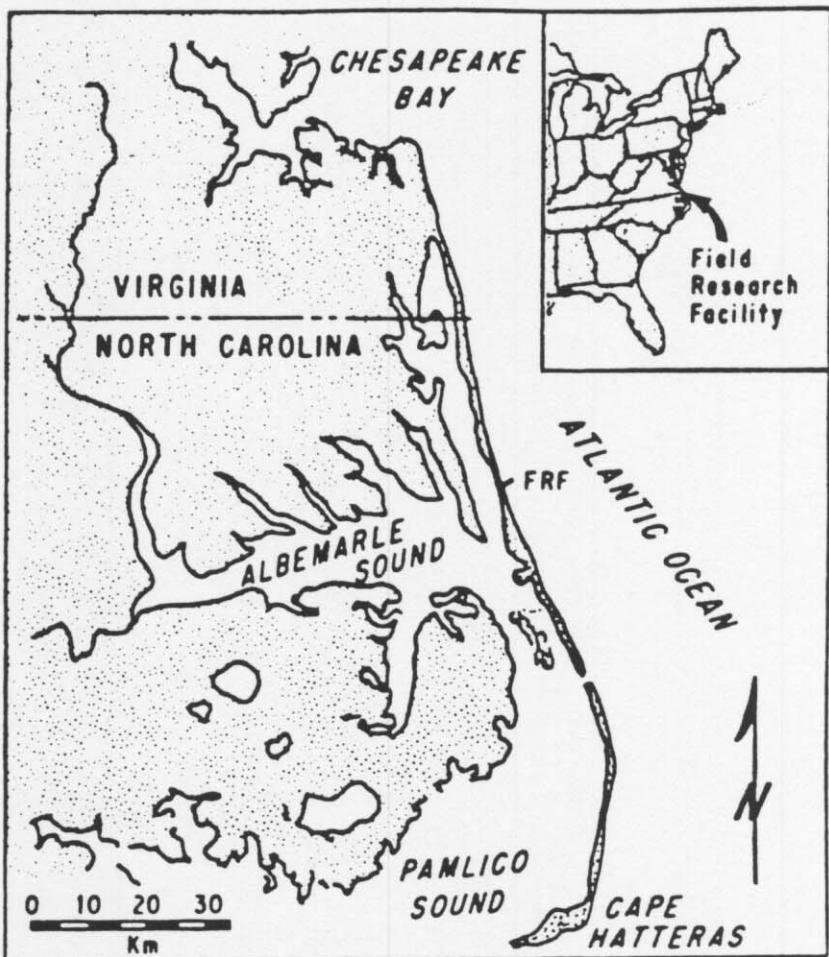


Figure 1. FRF location map

Table 1: Instrument Status/Data Availability

DEC 1988

Gage ID	Description/Remarks	Depth at Sensor		Day of the month																															
				1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	
616	Barometric Pressure		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	
			Analog Record	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
604	Precipitation		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
624	Air Temperature		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
632	Anemometer on Laboratory Building Elevation 19 m (NGVD)		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Analog Record	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
645	Baylor staff at station 7+80 on FRF pier	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	/	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
625	Baylor staff at station 19+00 on FRF pier	see Figure 7	Gage Status	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
			Data Collected	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
111	Pressure gage 309 m north of FRF pier (0.9 km offshore)	Approx. 7.8 m NGVD	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
630	Waverider buoy 6.0 km offshore	Approx. 23 m NGVD	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
679	Current meter 500 m south of FRF pier (0.5 km offshore)	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
865-1370	NOAA tide station at seaward end of FRF pier		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Daily observation	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Supplemental Observations (daily oceanographic and meteorological observations)			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

Gage Status	Daily Observation	Analog Record	Data Collected
Operational = *	Complete = *	Complete = *	All = *
Partial = /	Partial = /	Partial = /	Partial = /
Non-Operational = -	None = -	None = -	None = -

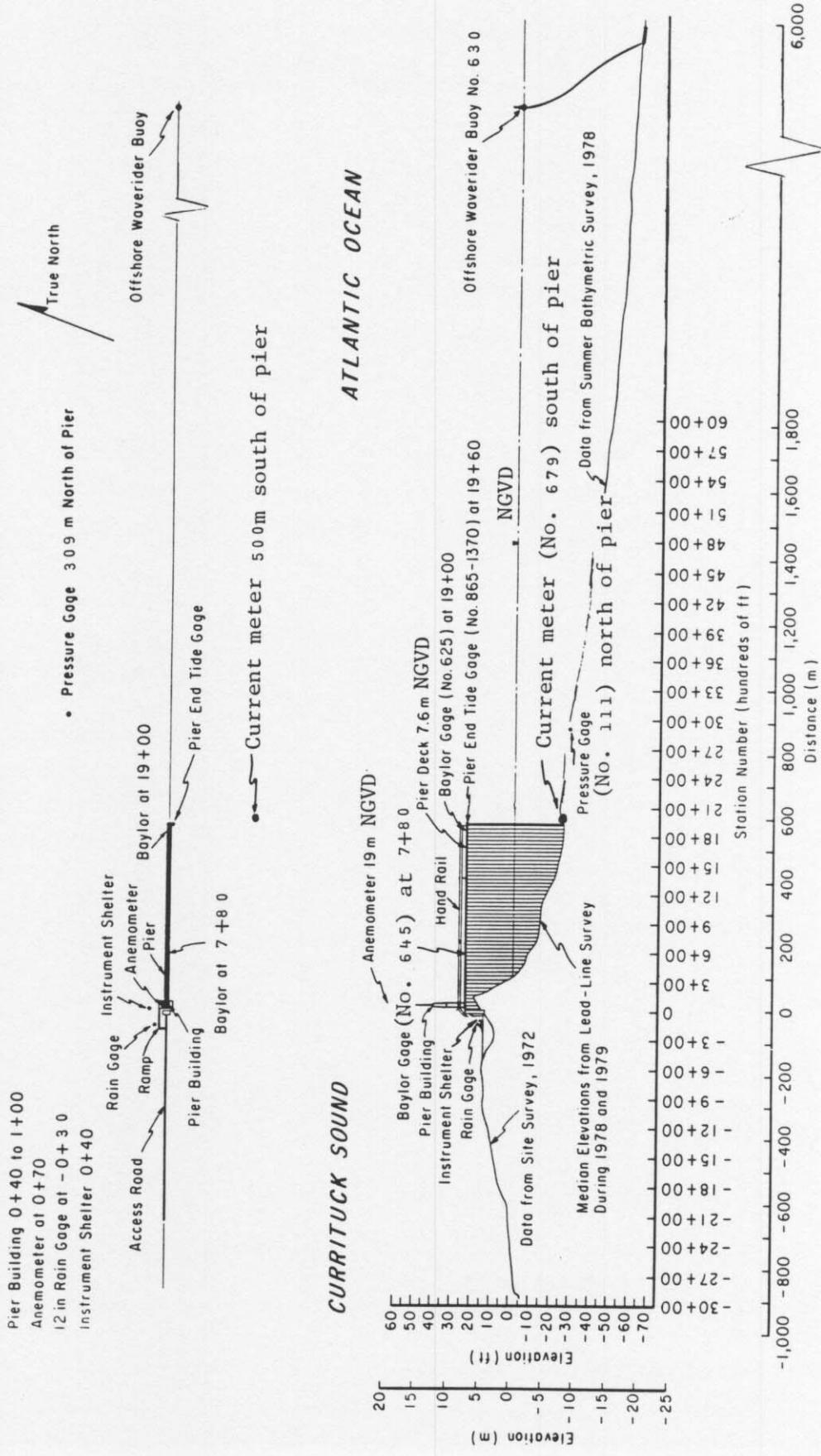


Figure 2. Instrument locations at FRF

PART II: METEOROLOGICAL DATA

A variety of instruments have been installed at the FRF (Figure 2) to monitor the meteorological conditions. The data presented in Table 2 are collected and stored on magnetic tape using a Digital Equipment Corporation VAX 11/750. For each instrument identified in Table 1 as having analog outputs, chart records are obtained, a log is maintained and the records are stored for future reference.

Winds were measured on top of the laboratory building at an elevation of 19 m (Figure 2) using a Weather Measure Skyvane anemometer.

Monthly resultant wind speeds and directions are determined by vector averaging the data. Temperature and atmospheric pressure means are the average of the values presented for the month. Total precipitation is the sum for the month.

The following may be useful for converting the data in Table 2 to other frequently used units of measurement:

1. Millimeters (mm) to inches (in.) -
 $mm \times .03937 = in.$
2. Millibars (mb) to inches of mercury (in. Hg) -
 $mb \times 0.02953 = in. Hg$
3. Degrees Celsius (C) to degrees Fahrenheit (F) -
 $(C \times 9/5) + 32 = F$
4. Meters per second (m/s) to knots (kn) -
 $m/s \times 1.943 = kn$

Table 2: Meteorological Data

Dec 1988						
Day	Hour	Wind Speed m/sec	Wind Direction deg TN	Temperature deg C	Atm Pressure mb	Precipitation mm
1	100	6	238	10.7	1015.5	0
	700	7	293	6.5	1018.2	0
	1300	3	307	10.0	1017.2	0
	1900	4	302	7.4	1019.2	0
2	100	6	278	7.2	1019.2	0
	700	6	323	4.2	1023.0	0
	1300	4	329	7.2	1022.3	0
	1900	7	261	6.8	1022.6	0
3	100	7	246	7.7	1021.3	0
	700	6	253	5.7	1021.3	0
	1300	6	242	10.7	1017.5	0
	1900	7	218	11.6	1015.2	0
4	100	10	234	10.6	1012.8	0
	700	5	308	8.5	1017.2	0
	1300	12	346	8.1	1022.6	0
	1900	3	310	4.6	1025.0	0
5	100	3	268	3.3	1024.0	0
	700	4	289	3.5	1024.7	0
	1300	4	248	7.5	1022.3	0
	1900	5	238	7.1	1021.3	0
6	100	6	242	7.3	1021.3	0
	700	4	255	5.1	1021.9	0
	1300	4	195	11.1	1020.3	0
	1900	5	192	8.6	1017.9	0
7	100	7	230	8.7	1016.9	0
	700	8	214	7.6	1016.2	0
	1300	4	229	12.2	1014.5	0
	1900	4	204	10.8	1014.5	0
8	100	6	223	9.2	1015.9	0
	700	4	269	7.0	1018.2	0
	1300	9	3	12.1	1019.6	0
	1900	8	26	10.0	1022.3	0
9	100	8	49	9.6	1021.6	0
	700	7	52	9.6	1018.2	0
	1300	14	359	5.5	1016.2	3
	1900	7	309	3.6	1017.9	0
10	100	6	304	1.4	1019.2	0
	700	5	308	0.2	1019.9	0
	1300	1	242	4.4	1017.9	0
	1900	4	220	3.7	1016.5	0
11	100	6	228	4.5	1015.5	0
	700	4	294	1.5	1017.2	0
	1300	12	358	3.4	1017.9	0
	1900	10	347	1.8	1020.9	0
12	100	12	357	0.5	1022.6	0
	700	12	8	0.0	1024.7	0
	1300	10	357	-1.5	1025.3	0
	1900	7	17	1.1	1023.6	0
13	100	5	320	-1.8	1017.9	0
	700	6	313	-0.3	1012.8	0
	1300	5	310	1.8	1008.7	0
	1900	8	292	-0.4	1010.8	0
14	100	6	292	-0.9	1013.8	0
	700	5	294	-0.8	1019.2	0
	1300	3	209	5.8	1018.9	0
	1900	5	176	4.5	1017.9	0
15	100	4	203	5.0	1017.2	0
	700	6	216	6.5	1016.9	0
	1300	6	231	10.2	1015.5	0
	1900	3	212	8.1	1017.2	0
16	100	12	11	6.5	1019.9	0
	700	13	357	2.1	1022.6	0
	1300	10	354	0.7	1020.6	0
	1900	7	9	0.8	1018.2	0

(Continued)

(Sheet 1 of 2)

Table 2: Meteorological Data

Dec 1988

Day	Hour	Wind	Wind	Temperature	Atm	Precipitation
		Speed m/sec	Direction deg TN	deg C	Pressure mb	mm
17	100	6	314	-1.9	1014.8	0
	700	5	303	-1.7	1011.8	0
	1300	5	287	-0.6	1010.1	0
	1900	4	285	-0.9	1013.5	0
18	100	8	291	-1.6	1014.8	0
	700	7	279	-3.2	1019.6	0
	1300	4	286	1.3	1019.2	0
	1900	4	204	0.4	1020.6	0
19	100	5	207	1.2	1020.3	0
	700	6	224	1.5	1021.6	0
	1300	4	207	7.2	1023.3	0
	1900	4	195	5.0	1024.7	0
20	100	4	200	3.8	1025.3	0
	700	5	209	4.9	1027.0	0
	1300	3	228	10.5	1026.3	0
	1900	5	183	9.4	1025.7	0
21	100	5	210	8.7	1025.0	0
	700	5	219	8.2	1023.3	0
	1300	5	234	15.6	1021.3	0
	1900	3	196	13.1	1020.9	0
22	100	3	23	9.5	1023.3	3
	700	11	9	7.8	1027.7	0
	1300	9	14	7.6	1029.4	0
	1900	8	17	7.1	1029.7	0
23	100	4	10	8.4	1027.4	0
	700	2	358	8.6	1024.3	0
	1300	4	179	16.8	1021.3	0
	1900	2	191	15.3	1021.3	0
24	100	3	258	10.1	1020.3	0
	700	1	138	9.8	1018.9	0
	1300	6	191	16.9	1015.2	0
	1900	9	194	14.8	1011.8	0
25	100	6	206	13.7	1011.1	0
	700	3	255	10.3	1014.2	0
	1300	2	38	11.6	1016.9	0
	1900	1	132	6.6	1020.3	0
26	100	5	355	7.9	1022.6	0
	700		UPS inoperative			0
	1300	9	355	7.4	1028.4	0
	1900	8	14	6.3	1030.1	0
27	100	6	27	6.4	1031.1	0
	700	5	67	7.3	1030.4	0
	1300	2	101	11.0	1028.4	0
	1900	4	136	8.8	1025.0	0
28	100	5	181	11.4	1021.3	0
	700	5	180	14.2	1017.5	0
	1300	11	200	17.8	1011.1	0
	1900	8	275	14.3	1013.8	0
29	100	5	315	8.4	1019.6	0
	700	11	12	4.0	1025.0	0
	1300	7	12	4.0	1026.0	0
	1900	4	19	3.3	1024.7	0
30	100	5	22	4.2	1022.6	0
	700	7	19	5.1	1023.3	0
	1300	3	27	6.7	1021.3	0
	1900	2	270	6.5	1020.9	0
31	100	6	201	5.4	1016.9	4
	700	5	258	6.5	1017.5	0
	1300	5	356	8.2	1018.6	0
	1900	5	61	8.3	1019.6	0
		Resultant 2	299	Mean 6.5	Mean 1020.0	Total 10

(Sheet 2 of 2)

PART III: WAVE DATA

Wave data are collected from two Baylor staff gages (Gages 625 and 645), a pressure wave gage (Gage 111) and a Waverider buoy (Gage 630) as shown in Table 1 and Figure 2. The data are collected, analyzed, and stored on magnetic tape using a Digital Equipment Corporation VAX 11/750 programmed to sample the wave gages every 6 hr (more frequently during storms) beginning at 0100, 0700, 1300, and 1900 EST. The sampling rate is two times per second for four contiguous 34-min records.

Wave height H_{mo} is an energy-based statistic equal to four times the standard deviation of the sea surface elevations. Wave height reported from the pressure gage has been compensated for hydrodynamic attenuation using linear wave theory. Wave period is identified from the computation of a variance (energy) spectrum with 60 deg of freedom calculated from a 34-min record. Peak wave period T_p is defined as the period associated with the maximum energy in the spectrum. When this analysis is complete, the data are written to magnetic tape.

Table 3 presents the wave heights and periods for each wave record obtained at 6 hr intervals during the month. The monthly means and standard deviations from the means shown in Table 3 are average values computed from this data. Figure 3 is a time history of all H_{mo} and T_p values obtained for all gages.

Differences in wave periods between wave gages (Table 3 and Figure 3) may be the result of wave breaking, wave reformation, or the presence of multiple wave trains containing nearly equal energy.

Table 3: Wave Data

Dec 1988

Day	Hour	645		625		111		630	
		Baylor at 7+80	Hmo,m	Baylor at 19+00	Hmo,m	Pressure Gage	T(sec)	Farshr Wvrdr	Hmo,m
1	0100	0.15	13.47	Baylor at 19+00	Hmo,m	0.32	13.47	0.37	12.80
	0700	0.29	3.51			0.40	3.41	0.72	4.00
	1300	0.34	3.94			0.52	3.61	0.62	4.27
	1900	0.46	5.57			0.53	5.45	0.62	4.92
2	0100	0.35	4.83	Hmo,m	T(sec)	0.43	4.41	0.50	4.83
	0700	0.88	5.33			1.32	5.69	1.72	5.82
	1300	0.88	5.95			1.13	5.95	1.21	5.95
	1900	0.65	6.09			*		0.80	6.40
3	0100	0.19	5.69	Pressure Gage	T(sec)	0.25	5.02	0.46	2.37
	0700	0.10	17.07			0.17	12.80	0.27	2.23
	1300	*				0.17	6.74	0.25	2.03
	1900	*				0.17	11.64	0.32	2.13
4	0100	0.11	16.00	Gage	Inoperative	0.17	3.66	0.49	2.72
	0700	0.20	2.56			0.20	6.92	0.56	3.41
	1300	1.13	7.76			2.03	6.92	2.58	7.31
	1900	0.91	6.92			1.39	6.24	1.73	6.09
5	0100	0.88	5.95	Inoperative	T(sec)	1.03	7.76	1.20	7.11
	0700	0.64	6.74			0.72	7.53	0.97	6.24
	1300	0.45	5.82			0.59	6.56	0.77	6.56
	1900	0.16	5.82			0.29	5.82	0.28	5.95
6	0100	*		Inoperative	T(sec)	0.19	9.48	0.28	2.17
	0700	*				0.19	8.83	0.22	8.83
	1300	0.10	16.00			0.22	9.14	0.24	9.14
	1900	0.22	3.77			0.31	3.61	0.52	3.66
7	0100	0.15	2.69	Inoperative	T(sec)	0.23	3.33	0.48	3.33
	0700	0.14	2.78			0.18	3.41	0.49	2.56
	1300	*				0.17	15.06	0.28	4.49
	1900	0.13	2.88			0.17	3.82	0.30	3.37
8	0100	0.11	3.82	Inoperative	T(sec)	0.19	5.82	0.40	2.17
	0700	0.10	6.24			0.19	6.09	0.32	5.95
	1300	0.75	4.20			0.76	4.06	*	
	1900	0.83	5.33			0.93	5.12	1.12	5.57
9	0100	0.75	5.22	Inoperative	T(sec)	0.84	5.57	0.98	5.33
	0700	0.74	6.24			0.78	6.09	0.99	6.09
	1300	0.89	5.57			1.68	5.57	1.87	5.82
	1900	1.03	5.95			1.32	5.95	1.61	5.57
10	0100	0.81	5.95	Inoperative	T(sec)	1.09	6.24	1.19	5.45
	0700	0.81	5.57			0.85	5.82	1.04	5.57
	1300	0.62	5.33			0.66	5.12	0.81	5.45
	1900	0.45	5.22			0.60	15.06	0.65	14.22
11	0100	0.27	14.22	Inoperative	T(sec)	0.62	14.22	0.59	13.47
	0700	0.34	12.80			0.70	12.80	0.73	12.80
	1300	0.97	5.95			1.63	5.82	1.63	5.69
	1900	1.11	6.56			1.50	6.40	1.73	6.56
12	0100	0.91	6.40	Inoperative	T(sec)	1.65	6.09	1.83	5.95
	0700	1.13	6.56			1.80	6.40	2.04	6.74
	1300	0.88	6.92			1.68	6.74	1.77	6.74
	1900	0.86	6.56			1.29	6.40	1.38	6.92
13	0100	0.81	6.09	Inoperative	T(sec)	1.21	10.24	1.27	6.74
	0700	0.73	6.56			1.02	10.24	1.18	6.56
	1300	0.65	4.83			0.90	8.83	0.97	8.83
	1900	0.60	4.66			0.73	9.85	0.83	9.14
14	0100	0.46	10.24	Inoperative	T(sec)	0.63	10.67	0.79	8.83
	0700	0.68	5.45			0.77	9.85	0.93	6.09
	1300	0.99	7.53			1.23	7.11	1.28	7.53
	1900	0.75	8.00			1.05	9.48	1.09	9.85
15	0100	0.41	9.85	Inoperative	T(sec)	0.78	11.13	0.81	9.48
	0700	0.98	15.06			2.19	14.22	1.61	15.06
	1300	1.15	16.00			1.97	16.00	1.45	15.06
	1900	0.93	15.06			1.71	15.06	1.42	15.06
16	0100	1.23	15.06	Inoperative	T(sec)	2.00	13.47	1.89	15.06
	0700	0.94	15.06			2.24	14.22	2.19	6.56
	1300	1.18	14.22			1.74	14.22	1.71	13.47
	1900	0.82	13.47			1.41	12.80	1.39	6.92

* Electronic problems

(Continued)

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(Sheet 1 of 2)

Table 3: Wave Data

Dec 1988

Day	Hour	645		625		111		630	
		Baylor at 7+80	Hmo,m	Baylor at 19+00	Hmo,m	Pressure Gage	Hmo,m	Farshr Wvrdr	T,sec
17	0100	0.89	12.80		1.11	13.47	1.19		13.47
	0700	0.70	5.82		0.86	12.80	0.93		12.80
	1300	0.58	12.80		0.81	12.19	0.89		12.19
	1900	0.66	5.12		0.81	5.45	0.85		5.95
18	0100	0.71	5.69		0.82	6.74	1.00		7.31
	0700	0.88	6.56		1.10	7.11	1.38		6.09
	1300	0.83	5.57		1.00	8.53	1.23		8.26
	1900	0.63	5.33		0.83	9.85	0.87		10.24
19	0100	0.35	10.67		0.70	10.24	0.77		10.24
	0700	0.29	11.13		0.63	11.13	0.65		11.13
	1300	0.23	10.67		0.64	10.67	0.50		10.67
	1900	0.25	10.67		0.51	10.67	0.57		10.24
20	0100	0.18	10.24		0.44	9.85	0.44		9.85
	0700	0.17	10.67		0.36	10.24	0.43		9.85
	1300	0.11	9.85		0.31	9.85	0.29		9.85
	1900	0.19	2.48		0.28	9.14	0.38		9.48
21	0100	0.16	16.00		0.30	8.83	0.34		8.83
	0700	0.17	16.00		0.32	9.14	0.37		9.85
	1300	0.12	15.06		0.29	8.53	0.38		9.14
	1900	0.18	8.83		0.33	11.13	0.42		5.12
22	0100	0.14	10.24		0.36	10.67	0.44		8.83
	0700	0.52	3.71		0.67	3.51	0.86		3.66
	1300	0.74	5.95		*	1.44	6.09		
	1900	0.90	6.40		1.06	5.82	1.20		6.40
23	0100	0.71	5.95		0.95	6.92	1.00		6.24
	0700	0.70	6.92		0.94	7.31	1.06		10.67
	1300	0.69	6.40		0.90	6.40	0.99		10.24
	1900	0.64	5.22		0.93	5.33	1.04		4.92
24	0100	0.58	5.02		0.79	8.83	0.94		9.85
	0700	0.51	5.12		0.79	8.83	0.91		8.83
	1300	0.36	9.48		0.63	9.14	0.74		8.53
	1900	0.42	5.57		0.70	8.83	0.93		9.14
25	0100	0.34	8.83		0.56	7.76	0.81		9.14
	0700	0.33	8.83		0.55	6.92	0.74		8.26
	1300	0.21	8.83		0.49	8.83	0.59		8.53
	1900	0.27	7.76		0.55	8.83	0.65		7.76
26	0100	0.25	7.53		0.51	8.53	0.61		7.53
	0700				UPS inoperative				
	1300	0.87	7.11		1.49	6.92	1.67		6.92
	1900	0.87	6.24		1.08	7.53	1.20		6.92
27	0100	0.81	5.12		0.89	5.45	1.04		5.02
	0700	0.68	5.33		0.78	4.83	0.87		5.45
	1300	0.53	5.33		0.62	8.26	0.74		5.82
	1900	0.49	5.22		0.63	7.76	0.66		5.57
28	0100	0.44	5.02		0.60	7.76	0.66		8.26
	0700	0.36	5.12		0.61	9.48	0.75		5.22
	1300	0.55	5.95		0.79	6.74	1.25		6.56
	1900	0.50	7.31		0.71	7.53	0.91		7.31
29	0100	0.58	4.83		*	0.95	4.66		
	0700	0.92	6.40		1.57	6.09	1.85		6.24
	1300	0.92	6.74		1.14	6.40	*		
	1900	0.71	5.69		0.83	6.40	*		
30	0100	0.66	6.92		0.76	7.31	*		
	0700	0.67	6.24		0.79	6.24	*		
	1300	0.53	4.27		0.66	15.06	0.73		15.06
	1900	0.44	4.49		0.59	15.06	0.61		8.83
31	0100	0.29	16.00		0.48	15.06	0.61		9.14
	0700	0.20	8.53		0.39	9.14	0.43		9.48
	1300	0.28	13.47		0.36	14.22	0.47		10.24
	1900	0.28	9.48		0.36	9.48	0.42		9.14
Mean		0.56	7.76			0.80	8.46	0.91	7.58
Std dev		0.31	3.68			0.49	3.18	0.49	3.12

* Electronic problems

(Sheet 2 of 2)

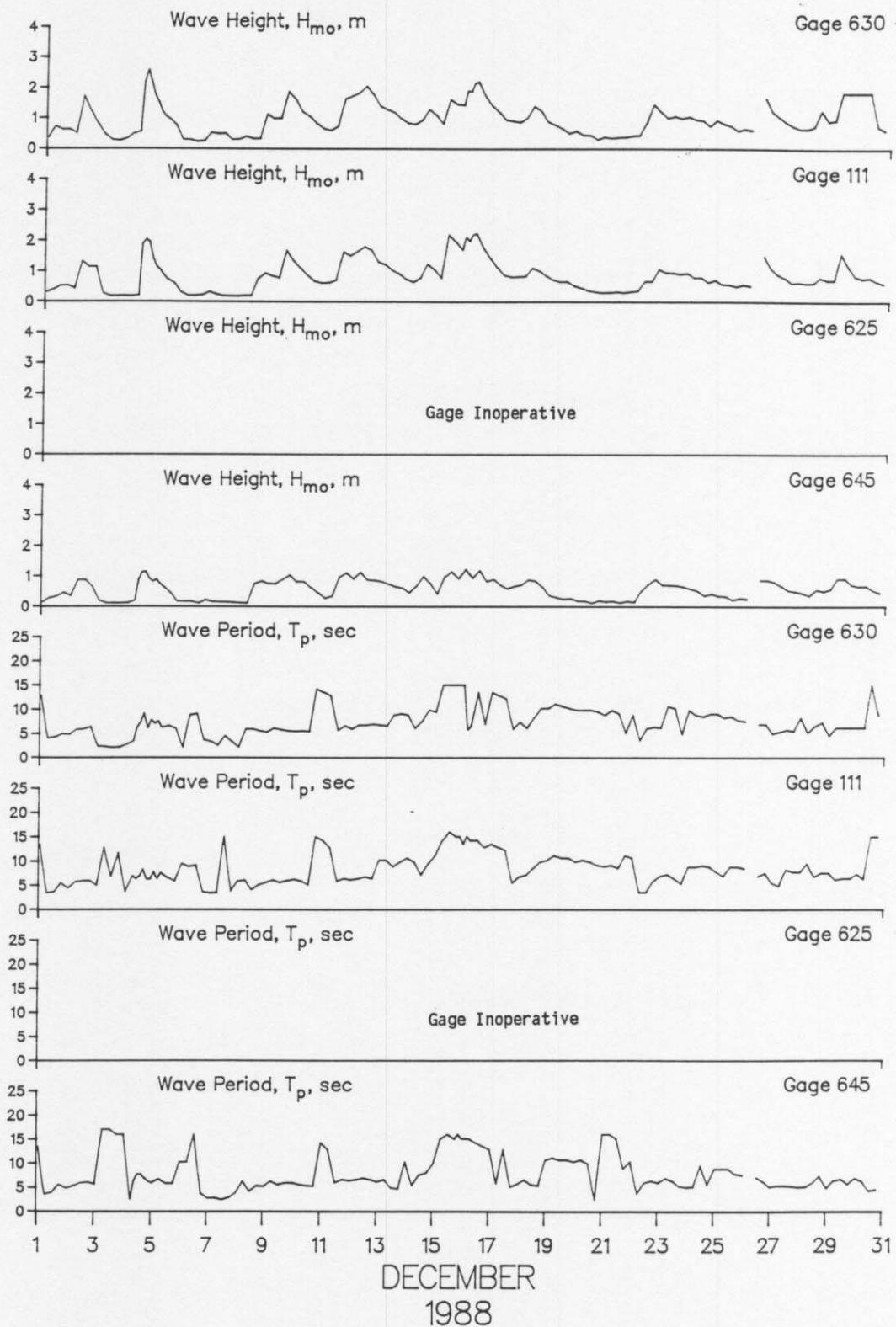


Figure 3. Time history of wave heights and periods

PART IV: CURRENT DATA

Current data (Table 4) are collected from a Marsh-McBirney electromagnetic biaxial current meter (Table 1 and Figure 2) and by visually observing the movement of dye on the water surface in the surf and at the seaward end of the pier, as well as 500 m updrift of the pier 12 m offshore.

Since the shoreline orientation is approximately N20W, longshore currents flow either toward 340 deg (i.e. northward) or toward 160 deg (i.e. southward). Similarly, cross-shore currents are either onshore (westward) or offshore (eastward).

All current speeds are given in centimeters per second (cm/sec). Resultant speeds and directions are determined by vector averaging the data.

Table 4: Current Data
Dec 1988

Alongshore Cross-shore Resultant Time Day	Pier Measurements						Beach Measurements (500m Updrift)			Current Meter at South Tripod		
	Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	Depth -4.8m (NGVD) ID #679
1 0100-Along Cross Result										8	N	
1 0700-Along Cross Result	24	S		29	S			18	S	3	S	
	6	off		152	12					0		
	25	146			31	138				3	160	
1 1300-Along Cross Result										7	S	
										2	off	
										7	144	
1 1900-Along Cross Result										5	S	
										0		
										5	160	
2 0100-Along Cross Result										1	S	
										0		
										1	160	
2 0700-Along Cross Result	36	S		38	S			113	S	15	S	
	2	off		177	11					3	off	
	36	157			40	143				15	149	
2 1300-Along Cross Result										14	S	
										3	off	
										14	148	
2 1900-Along Cross Result										5	S	
										1	off	
										5	149	
3 0100-Along Cross Result										8	N	
										1	on	
										8	333	
3 0700-Along Cross Result	11	N		0				0		9	N	
	2	off		152	2	off				0		
	11	349			2	70				9	340	
3 1300-Along Cross Result										12	N	
										2	on	
										12	331	
3 1900-Along Cross Result										9	N	
										1	on	
										9	334	
4 0100-Along Cross Result										9	N	
										2	on	
										9	327	
4 0700-Along Cross Result	44	S		25	S			91	S	0		
	0			165	8					3	off	
	44	160			27	143				3	70	
4 1300-Along Cross Result										43	S	
										6	off	
										43	152	
4 1900-Along Cross Result										18	S	
										5	off	
										19	144	
5 0100-Along Cross Result										3	N	
										1	off	
										3	358	
5 0700-Along Cross Result	0			16	S			54	S	7	N	
	0			7	off					0		
	0	0		201	17	136				7	340	
5 1300-Along Cross Result										10	N	
										1	on	
										10	334	
5 1900-Along Cross Result										10	N	
										0		
										10	340	

KEY = All speeds in CM/SEC
 N = Northward, Shore parallel
 S = Southward, Shore parallel
 on = onshore off = offshore

Table 4: Current Data (Continued)
Dec 1988

Alongshore Cross-shore Resultant Time	Pier Measurements				Beach Measurements (500m Updrift)			Current Meter at South Tripod	
	Dye at (579 m) (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	Depth -4.8m (NGVD) ID #679
Day									
6 0100-Along Cross Result								9	N
								2	on
								9	327
6 0700-Along Cross Result	4 0	S 140	0			2 N		1	S
	4	160	0	0		North		1	off
								1	115
6 1300-Along Cross Result								1	N
								1	off
6 1900-Along Cross Result								1	25
								6	N
								1	on
								6	331
7 0100-Along Cross Result								11	N
								2	on
								11	330
7 0700-Along Cross Result	17 4 18	N off 354	5 2 5	N off 2		8 N		11	N
						South		1	on
								11	335
7 1300-Along Cross Result								13	N
								1	on
								13	336
7 1900-Along Cross Result								3	N
								1	off
								3	358
8 0100-Along Cross Result								4	N
								0	
								4	340
8 0700-Along Cross Result	0 0 0		6 0 6	S off 157		18 S		4	N
						North		0	
								4	340
8 1300-Along Cross Result								9	S
								2	off
								9	147
8 1900-Along Cross Result								16	S
								4	off
								16	146
9 0100-Along Cross Result								10	N
								3	off
								10	143
9 0700-Along Cross Result	6 9 11	S on 216	10 1 10	S off 151		58 S		5	S
						North		3	off
								6	129
9 1300-Along Cross Result								30	S
								5	off
								30	151
9 1900-Along Cross Result								23	S
								4	off
								23	150
10 0100-Along Cross Result								16	N
								1	off
								16	156
10 0700-Along Cross Result	32 5 32	S off 151	32 10 33	S off 143		62 S		12	S
						North		3	off
								12	146
10 1300-Along Cross Result								10	S
								2	off
								10	149
10 1900-Along Cross Result								7	N
								4	off
								8	130

KEY = All speeds in CM/SEC
 N = Northward, Shore parallel
 S = Southward, Shore parallel
 on = onshore off = offshore

Table 4: Current Data (Continued)
Dec 1988

Day	Time	Pier Measurements				Beach Measurements			Current Meter at South Tripod	
		Alongshore Cross-shore Resultant		Dye at Mid-Surf Zone (surface)		(500m Updrift)			Depth -4.8m (NGVD) ID #679	
		Dye at (579 m) (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	Speed
11	0100-Along Cross Result	Speed	Dir							1
11	0700-Along Cross Result	0		11	S					1
11	1300-Along Cross Result	0	138	10	off		47	S		1
11	1900-Along Cross Result	0	0	14	118	North				295
12	0100-Along Cross Result									14
12	0700-Along Cross Result	41	S							N
12	1300-Along Cross Result	0	off	76	S					on
12	1900-Along Cross Result	41	160	186	0	North	122	S		14
13	0100-Along Cross Result									33
13	0700-Along Cross Result	12	S							S
13	1300-Along Cross Result	3	off	29	S					off
13	1900-Along Cross Result	13	146	7	on	North	11	S		33
14	0100-Along Cross Result									151
14	0700-Along Cross Result	12	S							S
14	1300-Along Cross Result	2	off	177	5					off
14	1900-Along Cross Result	12	151	30	off	North	73	S		151
15	0100-Along Cross Result									12
15	0700-Along Cross Result	16	N							S
15	1300-Along Cross Result	4	off	0						off
15	1900-Along Cross Result	17	354	0	0	South	10	N		136

KEY = All speeds in CM/SEC

N = Northward. Shore parallel

N = Northward, Shore parallel
S = Southward, Shore parallel

S = southward, Shore parallel
 on = onshore off = offshore

Table 4: Current Data (Continued)
Dec 1988

Alongshore Cross-shore Resultant Time	Pier Measurements				Beach Measurements (500m Updrift)				Current Meter at South Tripod				
	Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	Depth -4.8m (NGVD)	ID #679
Day													
16 0100-Along Cross Result										27	S		
										7	off		
										28	145		
16 0700-Along Cross Result	76	S		68				76	S	32	S		
	0	off		0						9	off		
	76	160		68						33	144		
16 1300-Along Cross Result										25	S		
										6	off		
										26	147		
16 1900-Along Cross Result										15	S		
										3	off		
										15	149		
17 0100-Along Cross Result										10	S		
										3	off		
										10	143		
17 0700-Along Cross Result	22	S		20				37	S	12	S		
	0	off		18						5	off		
	22	160		27						13	137		
17 1300-Along Cross Result										12	S		
										3	off		
										12	146		
17 1900-Along Cross Result										13	S		
										4	off		
										14	143		
18 0100-Along Cross Result										9	S		
										0			
										9	160		
18 0700-Along Cross Result	20	S		61				48	S	13	S		
	6	off		177						5	off		
	21	143		64						14	139		
18 1300-Along Cross Result										10	S		
										6	off		
										12	129		
18 1900-Along Cross Result										12	S		
										5	off		
										13	137		
19 0100-Along Cross Result										3	N		
										1	on		
										3	322		
19 0700-Along Cross Result	13	N		19				8	N	8	N		
	12	off		3						5	on		
	18	22		19						9	308		
19 1300-Along Cross Result										14	N		
										3	on		
										14	328		
19 1900-Along Cross Result										6	N		
										2	on		
										6	322		
20 0100-Along Cross Result										12	N		
										3	on		
										12	326		
20 0700-Along Cross Result	18	N		18				9	N	8	N		
	3	off		3						0			
	19	349		19						8	340		
20 1300-Along Cross Result										10	N		
										2	on		
										10	329		
20 1900-Along Cross Result										6	N		
										2	on		
										6	322		

KEY = All speeds in CM/SEC
 N = Northward, Shore parallel
 S = Southward, Shore parallel
 on = onshore off = offshore

Table 4: Current Data (Continued)
Dec 1988

Day	Alongshore Cross-shore Resultant Time	Pier Measurements				Beach Measurements (500m Updrift)				Current Meter at South Tripod Depth ~4.8m (NGVD) ID #679				
		Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	Speed	Dir
21 0100-Along Cross Result													15	N
21 0700-Along Cross Result	13 3 13	N off 354			5 0 5	N off 340			37 N	North			2	on
21 1300-Along Cross Result													9	N
21 1900-Along Cross Result													2	on
21 1900-Along Cross Result													9	327
22 0100-Along Cross Result													3	N
22 0700-Along Cross Result	32 10 33	S on 177			29 0 29	S off 160			128 S	North			0	
22 1300-Along Cross Result													3	340
22 1900-Along Cross Result													19	S
22 1900-Along Cross Result													4	off
23 0100-Along Cross Result													19	148
23 0700-Along Cross Result	18 3 18	S off 151			0 8 8				0	North			16	S
23 1300-Along Cross Result													4	off
23 1900-Along Cross Result													16	146
24 0100-Along Cross Result													11	S
24 0700-Along Cross Result	11 4 12	S off 141			27 4 27	N on 331			20 N	North			9	
24 1300-Along Cross Result													6	off
24 1900-Along Cross Result													11	126
25 0100-Along Cross Result													6	S
25 0700-Along Cross Result	3 2 4	S off 123			51 0 51	N 0 340			18 N	South			4	
25 1300-Along Cross Result													1	N
25 1900-Along Cross Result													4	on
													4	264
													2	
													4	313
													8	N
													2	on
													8	326
													1	N
													4	off
													4	56
													1	N
													1	on
													1	295

KEY = All speeds in CM/SEC
 N = Northward, Shore parallel
 S = Southward, Shore parallel
 on = onshore off = offshore

Table 4: Current Data (Continued)
Dec 1988

Day	Alongshore Cross-shore Resultant Time	Pier Measurements				Beach Measurements (500m Updrift)			Current Meter at South Tripod Depth -4.8m (NGVD) ID #679					
		Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	Speed	Dir
26	0100-Along Cross Result												4	S
													1	off
													4	146
26	0700-Along Cross Result	36	S			87	S			123	S			
		0	off		188	13	off		North					
		36	160			88	151							
26	1300-Along Cross Result												21	S
													5	off
													22	147
26	1900-Along Cross Result												14	S
													5	off
													15	140
27	0100-Along Cross Result												14	S
													5	off
													15	140
27	0700-Along Cross Result	7	S			11	S			24	S		3	S
		0	off		177	5	on		North				4	off
		7	160			12	184						5	107
27	1300-Along Cross Result												2	S
													3	off
													4	104
27	1900-Along Cross Result												0	
													1	on
													1	250
28	0100-Along Cross Result												3	S
													1	off
													3	142
28	0700-Along Cross Result	41	N			51	N			70	N		7	N
		6	off		177	0	off		North				2	on
		41	349			51	340						7	324
28	1300-Along Cross Result												19	N
													2	on
													19	334
28	1900-Along Cross Result												12	N
													3	on
													12	326
29	0100-Along Cross Result												6	S
													1	off
													6	151
29	0700-Along Cross Result	47	S			68	S			66	S		23	S
		0	off		188	20	off		North				4	off
		47	160			71	143						23	150
29	1300-Along Cross Result												15	S
													3	off
													15	149
29	1900-Along Cross Result												2	S
													0	
													2	160
30	0100-Along Cross Result												6	S
													1	off
													6	151
30	0700-Along Cross Result	21	S			41	S			14	S		8	S
		5	on		177	0	off		North				2	off
		22	174			41	160						8	146
30	1300-Along Cross Result												5	S
													1	off
													5	149
30	1900-Along Cross Result												7	S
													1	off
													7	152

KEY = All speeds in CM/SEC
N = Northward, Shore parallel
S = Southward, Shore parallel
on = onshore off = offshore

Table 4: Current Data (Concluded)
Dec 1988

Day	Alongshore Cross-shore Resultant ---- Time	Pier Measurements				Beach Measurements (500m Updrift)			Current Meter at South Tripod Depth -4.8m (NGVD) ID #679	
		Dye at (579 m) (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	Speed
31	0100-Along Cross Result									1
31	0700-Along Cross Result	9 3 9	S off 143	165	9 5 11	S off 129	North	9	S	2
31	1300-Along Cross Result									2
31	1900-Along Cross Result									5

KEY = All speeds in CM/SEC
 N = Northward, Shore parallel
 S = Southward, Shore parallel
 on = onshore off = offshore

PART V: SUPPLEMENTAL OBSERVATIONS

Visual wave direction measurements (Table 5) of both the primary wave train (i.e. that having the larger wave heights) and the secondary wave train (which must be clearly distinguishable as a wave train separate from the primary waves but not surface chop or capillary waves) are taken daily at the seaward end of the pier. The direction of the primary wave train just north of the seaward end of the pier is also determined using a Raytheon Marine Pathfinder radar and measuring the alignment of the wave crests at approximately the same location as the visual measurements. The pier axis (considered perpendicular to the beach at the FRF) is orientated 70 deg east of true north; consequently, wave angles greater than 70 deg indicate that the waves were coming from the south side of the pier.

The width of the surf zone (seawardmost breaker position to shoreline) is determined from the pier deck.

Measurements of surface water temperature, density, and visibility are also taken daily at the seaward end of the pier. A jar along with a thermometer is lowered about 0.3 m into the water and allowed to remain for at least one minute. The jar is removed, the temperature read, and a hydrometer is used to determine the density. A Secchi disc is used to determine the surface visibility.

Table 5: Supplemental Observations

Dec 1988

Day	Time	Wave Approach			Radar Wave Angle deg from True N	Width of Surf Zone,m	Water Characteristics at Pier End		
		Primary	Secondary	deg from True N			Density g/cc	Secchi Vis.,m	
1	0837	20			50	18	13.4	1.0260	1.5
2	0845	30			40	79	12.2	1.0260	0.9
3	0954	30				6	12.8	1.0274	3.0
4	0907	30			10	177	11.1	1.0260	0.9
5	0757	20				134	10.6	1.0274	1.2
6	0740	30			35	0	11.7	1.0262	2.1
7	0844	120			90	0	11.1	1.0260	2.1
8	0731	5			48	3	11.2	1.0262	3.0
9	0754	42			30	23	10.9	1.0263	2.1
10	0809	25			40	34	8.9	1.0258	2.1
11	0845	15			65	22	8.9	1.0257	1.8
12	0705	55	55		60	48	7.8	1.0250	0.9
13	0845	60			60	49	6.1	1.0248	0.9
14	0720	35			65	21	7.2	1.0248	2.1
15	0824	80				290	8.2	1.0248	0.6
16	0715	62			70	158	7.8	1.0263	0.9
17	0815	61	4		65	26	6.7	1.0261	1.2
18	0900	62	15		70	32	6.4	1.0254	1.8
19	0725	70			70	16	6.7	1.0256	1.5
20	0705	142			70	14	8.1	1.0261	1.5
21	0706	128			70	6	8.1	1.0263	1.2
22	0718	22			35	44	8.1	1.0263	1.2
23	0706	60			70	35	8.9	1.0263	1.5
24	0914	100			72	24	8.4	1.0239	3.4
25	1008	90				21	10.0	1.0264	1.8
26	0830	45			45	30	8.9	1.0263	1.2
27	0720	43			45	28	8.2	1.0260	3.4
28	0710	102	145		70	18	8.9	1.0259	2.4
29	0700	31			25	43	8.4	1.0261	1.5
30	0705	45			80	23	7.5	1.0257	1.8
31	0900	45	6		20	16	8.4	1.0260	2.1

PART VI: WATER LEVELS

Since 1978, the National Oceanic and Atmospheric Administration (NOAA)/National Ocean Service (NOS) has operated a primary tide station (No. 865-1370) at the seaward end of the FRF pier. A Leupold-Stevens digital recording float-type tide gage is used to collect instantaneous water level data every 6 minutes throughout the month.

The variation in water level during the month is shown in Figure 4 along with a list of mean and extreme values. This presentation is useful in identifying effects of both meteorological and astronomical forces on the open coast water level.

Table 6 contains the time at the center of each 12.42-hr tidal cycle and the range, high, low, and mean water levels during each tidal cycle.

FRF Tide Heights

Dec 1988

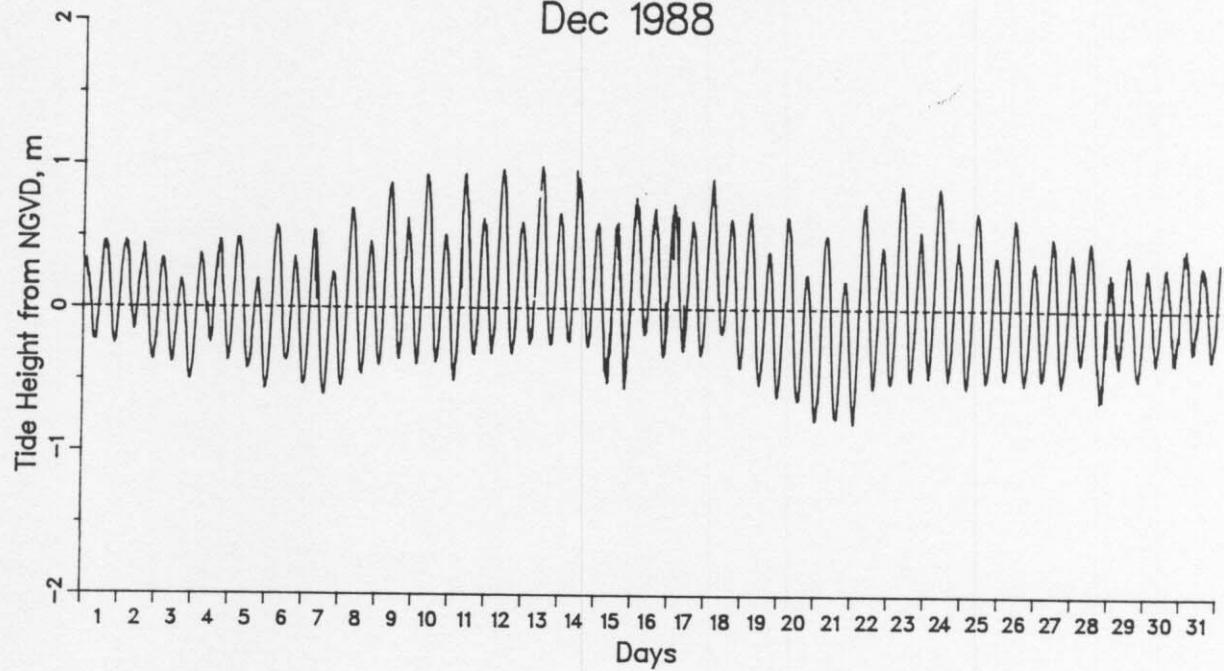


Figure 4. Water level time history

Monthly Water Levels, m NGVD

Extreme Low = -0.80 on day 21 at 2354 hr
Extreme High = 0.99 on day 13 at 1012 hr
Monthly Mean = 0.06
Mean Low = -0.43
Mean High = 0.64
Mean Range = 1.07

Table 6: Water Levels, m NGVD

Mid-Cycle Day	Time	Dec 1988	Low	High	Mean	Range
1	612	-0.23	0.46	0.08	0.68	
1	1837	-0.25	0.46	0.11	0.71	
2	703	-0.16	0.47	0.17	0.62	
2	1928	-0.37	0.44	0.00	0.81	
3	753	-0.38	0.34	-0.03	0.72	
3	2018	-0.50	0.27	-0.13	0.77	
4	843	-0.24	0.41	0.10	0.65	
4	2109	-0.37	0.48	0.07	0.85	
5	934	-0.42	0.48	-0.01	0.91	
5	2159	-0.56	0.51	-0.11	1.08	
6	1024	-0.37	0.57	0.06	0.94	
6	2249	-0.53	0.51	-0.07	1.04	
7	1115	-0.60	0.54	-0.09	1.14	
7	2340	-0.54	0.65	-0.05	1.19	
8	1205	-0.46	0.69	0.08	1.15	
9	30	-0.40	0.84	0.11	1.24	
9	1255	-0.35	0.87	0.23	1.23	
10	121	-0.39	0.93	0.17	1.32	
10	1346	-0.37	0.92	0.20	1.30	
11	211	-0.50	0.93	0.08	1.43	
11	1436	-0.32	0.94	0.22	1.26	
12	301	-0.31	0.97	0.24	1.28	
12	1527	-0.31	0.96	0.23	1.27	
13	352	-0.24	0.97	0.26	1.22	
13	1617	-0.25	0.99	0.27	1.23	
14	442	-0.23	0.97	0.26	1.19	
14	1707	-0.26	0.89	0.24	1.16	
15	532	-0.51	0.60	0.04	1.11	
15	1758	-0.55	0.73	0.09	1.28	
16	623	-0.18	0.78	0.29	0.95	
16	1848	-0.33	0.70	0.19	1.03	
17	713	-0.29	0.73	0.20	1.02	
17	1938	-0.32	0.73	0.18	1.05	
18	804	-0.17	0.91	0.30	1.08	
18	2029	-0.41	0.63	0.12	1.04	
19	854	-0.52	0.68	0.03	1.20	
19	2119	-0.61	0.62	-0.06	1.23	
20	944	-0.63	0.64	-0.07	1.27	
20	2210	-0.77	0.45	-0.22	1.22	
21	1035	-0.76	0.52	-0.16	1.27	
21	2300	-0.80	0.60	-0.19	1.40	
22	1125	-0.55	0.74	0.07	1.29	
22	2350	-0.52	0.73	0.02	1.25	
23	1216	-0.49	0.87	0.14	1.36	
24	41	-0.47	0.78	0.09	1.25	
24	1306	-0.49	0.85	0.13	1.34	
25	131	-0.55	0.65	-0.01	1.19	
25	1356	-0.50	0.68	0.03	1.18	
26	222	-0.48	0.60	0.00	1.09	
26	1447	-0.52	0.63	-0.01	1.15	
27	312	-0.48	0.48	-0.04	0.96	
27	1537	-0.53	0.51	-0.06	1.04	
28	402	-0.37	0.48	0.04	0.85	
28	1628	-0.63	0.48	-0.14	1.11	
29	453	-0.39	0.37	-0.02	0.77	
29	1718	-0.48	0.39	-0.09	0.87	
30	543	-0.37	0.30	-0.02	0.67	
30	1808	-0.37	0.40	-0.01	0.77	
31	634	-0.29	0.44	0.07	0.73	
31	1859	-0.34	0.34	-0.02	0.68	

PART VII: NEARSHORE PROFILES

A. Nearshore Profiles. In order to document profile response away from the pier, surveys of four profile lines extending 900 to 1,000 m from shore and located 489 and 581 m north and 517 and 608 m south of the FRF pier are conducted bi-weekly, after storms, and during more complete bathymetric surveys.

These profiles are obtained using the CRAB-Zeiss surveying system; a Zeiss Elta-2 first-order, self-recording electronic theodolite distance meter in combination with the Coastal Research Amphibious Buggy (CRAB), a 10.7 m high, self-powered, mobile tripod on wheels.

Figure 5 shows the last survey in November and the two surveys in December on profile line 188, located 517 m south of the pier. As a result of the mild wave conditions during the month, only minor changes occurred on the profile line. These included a reduction in the nearshore bar (160 to 280 m) and the removal of a berm (80 to 90 m) on the foreshore.

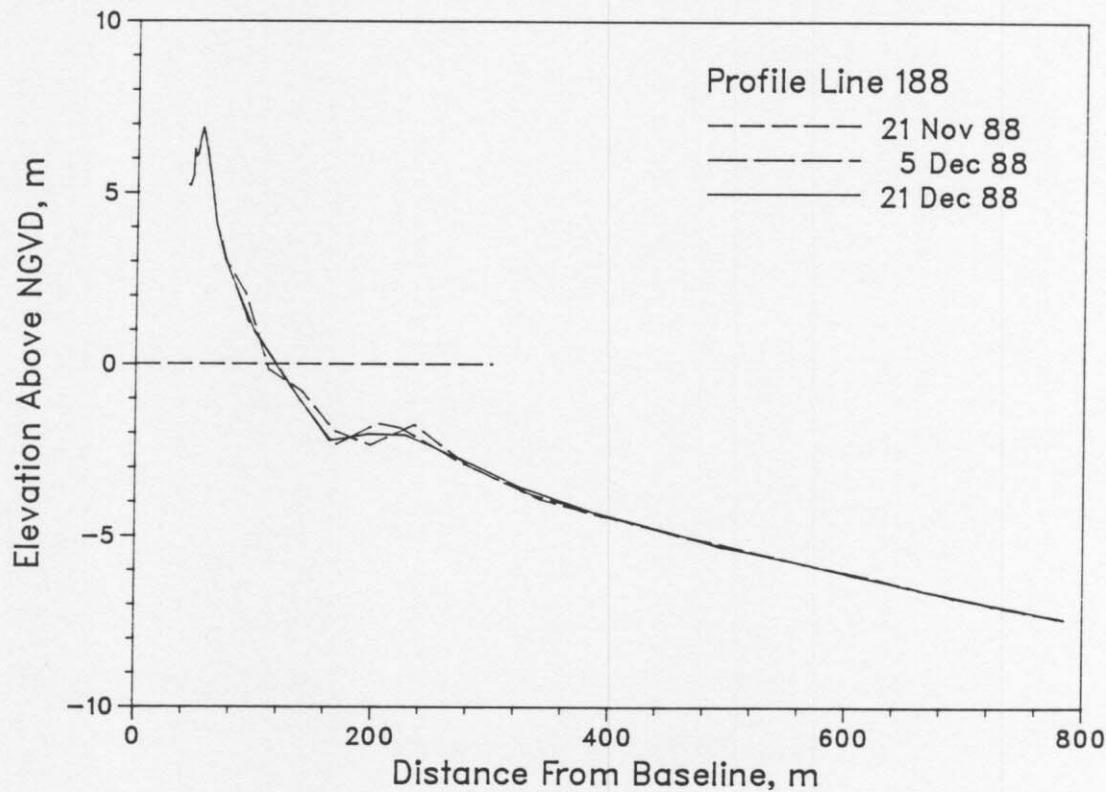


Figure 5. Monthly CRAB profiles on profile 188 -
517 m south of pier.

The profile envelope (Figure 6) reflects the maximum changes that occurred on the profile during 1988. No changes occurred in December.

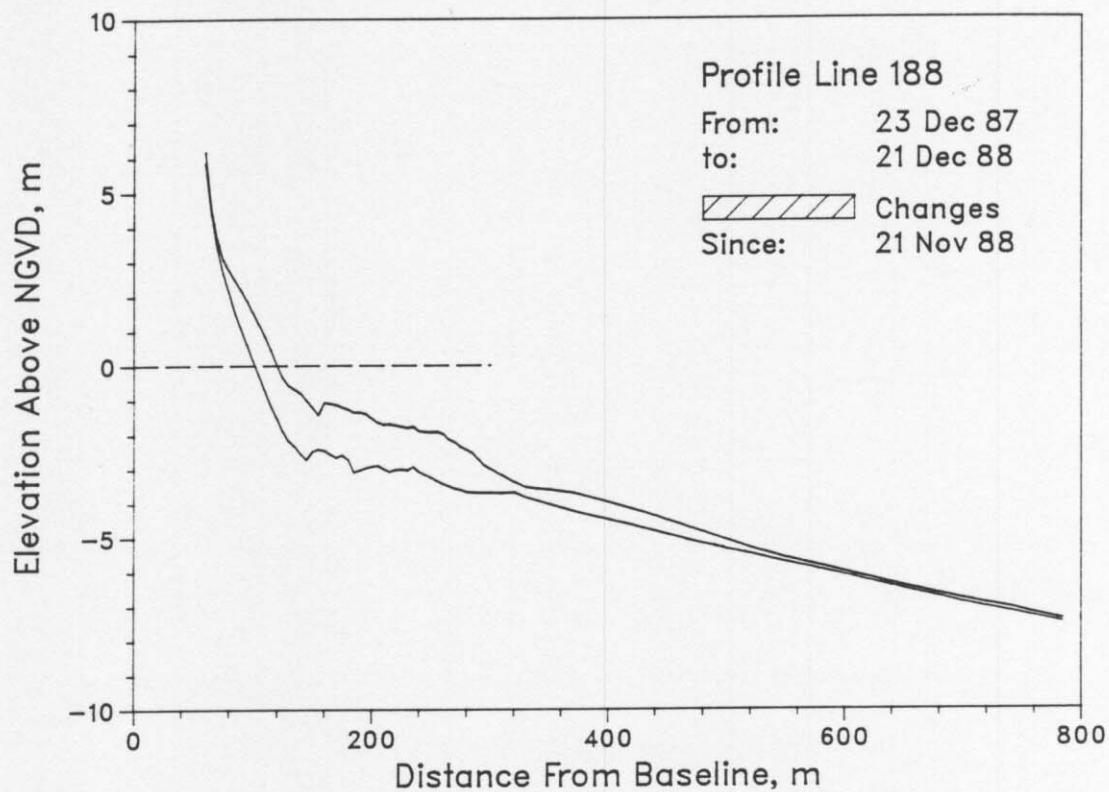


Figure 6. CRAB profile envelope - profile 188.

B. Bathymetry. Figure 7 includes a two- and three-dimensional contour map and a change plot derived from the bathymetric survey conducted on 19 December 88. Wide contour lines on the change diagram represent areas which eroded; thin lines indicate accretion.

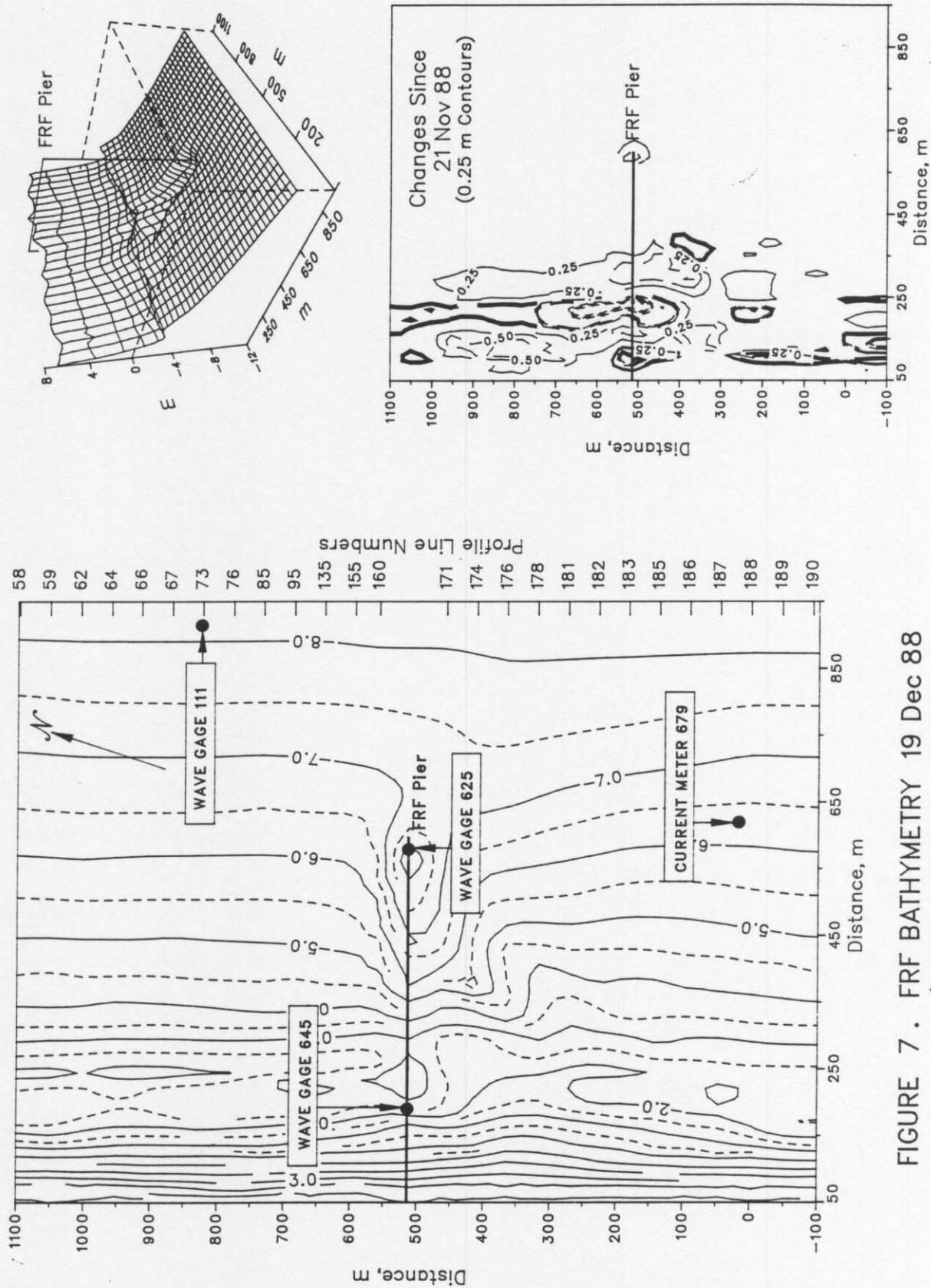


FIGURE 7. FRF BATHYMETRY 19 Dec 88
(Depths Relative to NGVD)

PART VIII: SPECIAL EVENTS

A. Storm Data Collection. The following list identifies times when wave heights exceeded 2 m at the seaward end of the pier. When this occurred, four contiguous 34-min wave records were obtained every three hours:

<u>Start</u>	<u>End</u>
4 Dec (1034)	4 Dec (1442)
15 Dec (0700)	16 Dec (0842)

B. Storm Synopsis.

4 December - A strong high pressure system centered over the south-eastern United States in combination with a storm located in Canada produced strong winds on 4 December. Maximum winds (from the north-northwest) exceeding 15 m/s were recorded at 1034 EST on 4 December and at 1142 EST the maximum H_{mo} (Gage 111) of 2.29 m ($T_p = 7.31$ sec) was recorded.

15-16 December - A strong storm located well offshore followed a track parallel to the east coast and generated northerly winds that peaked in excess of 13 m/s at 0242 EST on 16 December. At 0542 EST that same day, maximum H_{mo} (Gage 111) of 2.34 m ($T_p = 14.22$ sec) was recorded. Because the storm remained well offshore the atmospheric pressure was only slightly affected. There was no precipitation.

Distribution List

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OCE	U.S. Geological Survey
BERH	U.S. National Park Service
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NOAA (NOS, NWS)	U.S. Naval Fac. Eng. Com.
SAD	U.S. Naval Oceanographic Off.
SAW	U.S. Naval Research Lab

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